
METHODS

Stream habitat assessment methods for PNW streams abound (e.g. Overton et al. 1997, Pleus and Schuett-Hames 1998, Barbour et al. 1999). Many agencies in the region have developed their own protocols that use unique suites of channel features and channel feature definitions for the assessments. The habitat assessment protocol used here differs from others in that it incorporates a variety of methods used by local agencies. We have attempted to take into account the utility of each of these protocols as evaluated by Scholz and Booth (1998). In particular, methods were borrowed from the Timber, Fish, and Wildlife (TFW) Ambient Monitoring Manual, as well as a suite of other state, federal, and local protocols. The stream assessment protocol is described in detail in Appendix B.

Field Methods

The mainstem of Juanita Creek was assessed from its mouth at Lake Washington to the upper reaches just upstream of I-405. Survey segments were identified using breaks already defined by the Salmon and Steelhead Habitat Inventory and Assessment Project (SSHIA) (Figure 1, Appendix A). These segment breaks were determined using TFW methodology and gradient and confinement categories described in Pleus and Shuett-Hames (1998). The segments ranged from 0.55 to 1.34 kilometers long. At least 25% of each segment was assessed and assumed to be a representative sample, as determined by May, et al. (1997).

Reach Characterization

Riparian condition, land use, bank condition, and bankfull width and depth were measured and noted approximately every 25 meters in straight riffle habitats. The intervening lengths between measurements at riffle habitat units are referred to as reaches. The following sub-sections provide descriptions of the measurements conducted at each riffle habitat.

Riparian Condition—Riparian vegetation composition was visually estimated for each 25 meters of stream length. Dominant riparian vegetation categories were described for the right and left banks using the following categories:

- Forest (greater than 6 m in height): coniferous, deciduous, or mixed
- Shrubs and/or vines
- Tall herbaceous (e.g., unmowed field)
- Short herbaceous (e.g., mowed grass, pasture)
- Impervious (e.g., buildings, roads, asphalt, etc.)
- Residential landscaped (mowed lawn with ornamental shrubs/trees)

Presence of invasive plant species was also noted.

Bank Condition—Bank stability was determined at every riffle on each bank using a method modified from Booth (1994). The following categories were used:

- **Stable:** vegetated or low bars to level of low flow, or stabilizing features (rootwads, vegetation, etc.).
- **Unstable:** signs of imminent erosion, or less than 50% vegetative cover.
- **Armored:** artificial bank protection of any kind (rip rap, wire mesh, etc.)

Riparian vegetation, bank condition, and canopy cover were summarized over the length of each stream segment. Weighted means of these reach scale data were calculated by summing together reach lengths represented by a parameter category then dividing this total length by the total number of meters surveyed in the segment. Right and left bank data were combined to determine the percentage of the segments falling into each data category.

Bank full width and depth— Bank full width and depth were measured at each riffle habitat. Bank full discharge occurs when the water just fills the channel. The field indicators of bank full dimensions included: the top of point bars, the lower limit of perennial vegetation, change in slope, bank undercuts, and stain lines. Bank full width is the width between these field indicators on each bank. Bank full depth is the average depth of water at bank full stage.

Instream Habitat Inventory

The habitat assessment included in-channel measurements of aquatic habitat units and an inventory of large woody debris. Aquatic habitat units were identified as pools, riffles, or other (see definitions below). In pool habitats, maximum depth and pool tail-crest depths were recorded, as well as four thalweg depths. Residual pool depth was calculated from the maximum and pool tail-crest depths (Figure 2). A Pool Quality Index (PQI) score was determined for each pool using a rating system modified from Platts et al. (1983). Pools received a higher rating if they were deep and large in relation to the size of the channel, and had additional features that provided cover for fish such as woody debris, overhanging vegetation, or undercut banks.

Instream measurements-- Habitat units were defined as:

- Pool:** Areas where scouring water has carved out a non-uniform depression in the channel bed or where water has been dammed. Slow water, with a width at least 1/2 of the wetted channel width and 20 cm minimum residual pool depth (Figure 3).
- Riffle:** Swiftly flowing, turbulent water with hydraulic jumps (white-water); some partially exposed substrate; substrate cobble and/or boulder dominated.
- Other:** Includes non-turbulent water habitat types such as **Glides**—wide, uniform channel volume, no thalweg, low to moderate water velocity, and little surface agitation, and **Runs**—deep and fast with defined thalweg and little surface agitation (definitions from Overton et al. 1997).

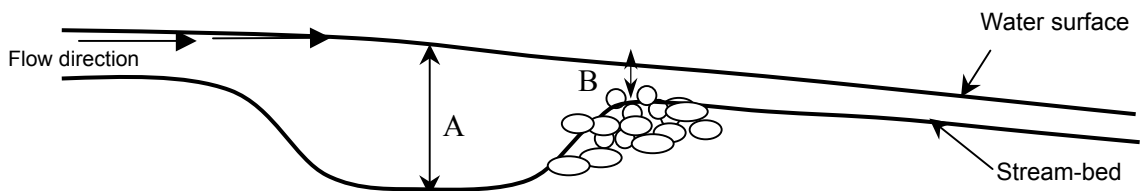


Figure 1. Measuring residual pool depth. The deepest point of the pool (A) minus the depth at the hydraulic control of the pool (B) is the residual pool depth. The hydraulic control has been described as where the last trickle of water would run out if the water were “turned off.”

The frequency of each parameter was calculated for each segment (the number of times occurred standardized by length of stream inventoried) and compared to published frequency values from natural conditions for this area. The methodology for evaluating these parameters is outlined below.

Riffle habitat in each stream segment was quantified by calculating the surface area of wetted stream channel classified as riffles. This number was used to calculate the percentage total stream habitat classified as riffle habitat. Because an equal proportion of pool and riffle habitat is often considered optimum, the riffle fraction should be from 40% to 60% (Peterson et al. 1992).

Pool habitat in each stream was quantified by calculating the surface area of wetted stream channel classified as pools. The percentage of total stream habitat classified as pools was also calculated. Target conditions for pool frequency have been proposed by a number of authors. Peterson et al. (1992) suggest that pools should comprise 50%, by area, in streams with less than a 3% gradient. Greater than 40% cover, by surface area has also been recommended for streams with a 2% to 5%

gradient (Washington Fish and Game Commission 1997, Washington Forest Practices Board 1997). The National Marine Fisheries Service (NMFS) Matrix of Pathways and Indicators (NOAA 1996) suggests that 30 pools/km for a stream, such as Juanita Creek that is 6 m wide indicate “properly functioning conditions” for purposes of implementing the Federal Endangered Species Act (ESA).

Large Woody Debris (LWD)– Large woody debris was defined as logs at least 2 meters (6 feet) in length and at least 15 cm (6 in) in diameter (Peterson et al. 1992), or rootwads of any size. All pieces of wood within the bankfull width and spanning the channel were counted. The length and diameter of each piece of LWD was measured and recorded in the habitat unit it occupied. The number of LWD pieces in a debris jam (DJ) was determined and the volume of the DJ (including the small pieces) was estimated from three dimensions: L x W x D.

The frequency of LWD occurrence was calculated for each segment and compared to published values from PNW natural conditions. Large woody debris frequency was compared to published frequency ranges in natural forested systems of the PNW. The low end of the natural range in several studies was 150 pieces/km (a range of 150-460 in Murphy and Koski 1989, a range of 150-400 in Ralph et al. 1994, and a range of 140-670 for streams of similar size and gradient in Beechie and Sibley 1997). Especially large pieces of LWD initiate the formation of stable woody debris jams (Naiman et al. 2000). The NMFS Matrix of Pathways and Indicators suggests 50 pieces/km that are at least 60 cm wide by 15 m long indicate “properly functioning conditions” (NOAA 1996). Although NMFS did not categorize this size class as “key pieces,” the large size range is comparable to the Washington State Forest Practices Board’s Watershed Analysis Manual (1997) and Washington Department of Fish and Wildlife’s (WDFW) Wild Salmonid Policy (1997) key piece size standard of 0.55 m diameter and 10 m in length for streams with a 6-10 m bankfull width. The Timber Fish and Wildlife (TFW) key piece criteria is based on a volume calculation that allows variable diameters and lengths (Schuett-Hames et al. 1999). The number of “large” diameter pieces was determined by counting all pieces of wood that met a minimum 50 cm diameter.

Tributaries, Wetlands, Side Channels, and Pipes

Notes were made on tributaries, wetlands, and side channels entering or adjacent to the stream, and location, size, and function of pipes (e.g., culverts, intakes). Notes were also taken to further describe the habitat quality, species identification, and presence of fish and wildlife. In addition, any obvious problems or concerns such as point of discharge or withdrawal for each reach were also described. Opportunity and/or need for protection or restoration projects were also noted.

Biology

Notes were made on the presence of juvenile and/or adult fish, freshwater mussels, amphibians and other biota. Juvenile salmonids, however, were not usually identified to species, although numbers or abundance was approximated. The reader should take into account that these are observations based on field notes and only represent conditions at the time of the assessment, and not a formal quantitative assessment of fish abundance. Moreover, it should be noted that the lack of an observation does not imply absence of a species from these sites.

Sediment Quality

Field notes regarding sediment quality were recorded for each segment. These remarks were either included in summary remarks about the segment or observations of specific locations.

Photographs

Photographs depicting the general nature of each assessed stream segment, as well as notable features were taken as the surveyors proceeded upstream. Representative photos will be included in this report to illustrate typical reaches or points of interest in each segment.

Water Quality

Water quality monitoring can reveal problems that may affect instream habitat quality. During this habitat assessment, limited water quality monitoring was performed on samples from Juanita Creek. These results will be compared with previous and future monitoring data.

Water quality was monitored at five total locations in segments 1, 2 and 3 (Figure 3). A HACH Sension156 Portable Multiparameter Meter was used to measure electrical conductivity, pH, temperature, and dissolved oxygen. Conductivity, pH, and temperature were measured from samples obtained on the afternoon of 10/06/2000. After recalibration of the dissolved oxygen meter, DO and temperature was measured from samples obtained on 11/14/2000. Two samples at each location were measured and the results were averaged.

Analysis

As previously mentioned, summarized instream and riparian values for each stream segment were compared to published values representing natural conditions or values that were determined to indicate naturally functioning conditions.

Matrix of Pathways and Indicators

In an effort to identify parameters indicative of ecosystem processes functioning in a manner that will maintain stable and healthy streams (for anadromous salmonid populations), [NMFS \,1996 #16] developed the “Matrix of Pathways and Indicators” as an evaluation tool (Appendix C). This matrix presents a number of environmental parameters important to production and survival of anadromous fishes and sets three condition levels for each parameter: (1) properly functioning, (2) at risk, and (3) not properly functioning. This matrix was also used by the WRIA 8 technical committee as a tool to aid in evaluating stream conditions within the PSL Ecoregion. If the data collected in these assessments could be compared with the NMFS matrix parameters, the results were presented with the matrix target conditions.

Quality Control

Two training sessions were held to prepare staff for the field survey season and assure accurate and precise data. A classroom session was held to discuss assessment protocols and the specific objectives of the habitat assessment. A second session was held in the field to provide surveyors with hands-on training in the use of the protocols and to provide surveyors with the opportunity to identify any questions or concerns with the methodology prior to the actual survey of Juanita Creek.

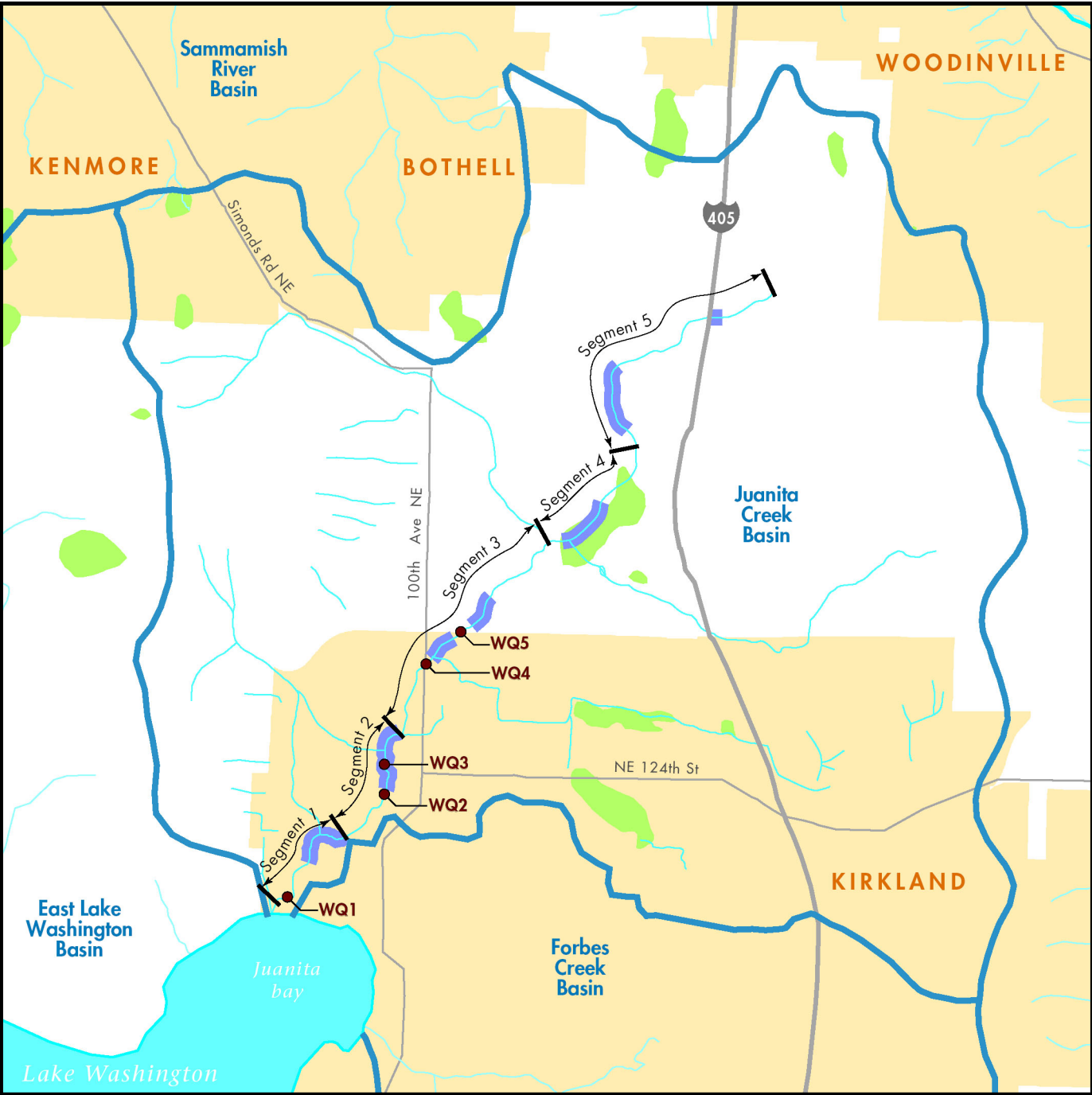


Figure 3
JUANITA CREEK HABITAT ASSESSMENT 2000

